

Create a Species

Describing a New Imaginary Species

BACKGROUND INFORMATION

CHARACTERISTICS OF LIVING THINGS

What are the characteristics of living things? (1) All living organisms are made of cells containing cytoplasm. The cytoplasm is made up of the same basic components in all forms of life — proteins, carbohydrates, lipids (fatty materials), water and nucleic acids. Some simple forms of life have only one cell, but most have many cells; the human body has trillions of them. (2) All living organisms exhibit growth. Living things utilize food and convert some of it into their own cytoplasm. As a result, they grow larger, at least during some periods of their lives. (3) All living organisms have a restricted size and shape. All members of a species stay within certain limits of size and body shape, though individual differences do occur. (4) All living organisms take in and release energy. The very act of living requires energy so all forms of life must have some means of obtaining it. Plants as a rule absorb their energy from sunlight, carbon dioxide and water. They store this energy in the form of food they manufacture and can draw upon this food for their energy needs. Animals, as a rule, must eat food from plants or other animals that have eaten plants to provide for their energy needs. Plants generally produce much more food than they need, otherwise, animal life could not exist. (5) Living things adapt to their environment. Living things respond to their environment in ways that are favorable to them. (6) Living things develop inherited adaptations; they can change over many generations so they can better survive. (7) Living organisms can reproduce and have a limited life span. (8) Living things contain nucleic acids. One nucleic acid is DNA (deoxyribonucleic acid) which is the substance of genes of heredity that make possible the transmission of traits from one generation to the next.

THE FIVE KINGDOMS OF LIVING THINGS

Today, the most generally accepted classification system of living organisms contains five kingdoms: Kingdom Monera, Kingdom Protista, Kingdom Fungi, Kingdom Plantae and Kingdom Animalia. (Some classification schemes further subdivide Monera into two groups: Eubacteria and Archaeobacteria.)

Kingdom Monera. Bacteria are placed in the Kingdom Monera, and in fact, the terms “bacteria” and “moneran” are interchangeable. Monerans are unicellular organisms (organisms that consist of only one cell). A moneran’s cell does not have its hereditary material enclosed in a nucleus, a trait unique to monerans. They also lack many other membrane-bound structures found in other cells. (Cells without membrane-bound organelles are called prokaryotic.) Because of their unique characteristics, monerans are considered to be very distantly related to the other kingdoms. Like other organisms, monerans can be placed into two categories based on how they obtain energy. Organisms that obtain energy by making their own food are called autotrophs. This name makes sense because the prefix *auto-* means self and the root word *-troph* means food. Organisms that cannot make their own food are called heterotrophs. The prefix *hetero-* means other. Heterotrophs may eat autotrophs in order to obtain food or they may eat other heterotrophs. But all heterotrophs ultimately rely on autotrophs for food. Scientists have evidence that monerans were the earliest life forms on Earth. They first appeared about 3.8 billion years ago (bya).

Kingdom Protista. Like all other kingdoms except Kingdom Monera, the protists are eukaryotic, which means that their cells contain a nucleus. The nucleus controls the functions of the cell and also contains the cell's hereditary material. In addition, the cell of a protist has special structures that perform specific functions for the cell. Protists are unicellular but include some species that live together in large colonies that give the appearance of being multicellular. A number of protists are capable of animal-like movement but also have some distinctly plantlike characteristics. Specifically, some protists are green in color from chlorophyll, and can use the energy of light to make their own food from simple substances. However, they are neither plants nor animals. Protists were the first kind of cells that contained a true nucleus. Ancient types of protists that lived millions and millions of years ago are probably the ancestors of fungi, plants, animals and the modern protists. The protozoa — a group of organisms commonly studied in life science that includes amoeba, paramecium and euglena — are classified in this kingdom.

Kingdom Fungi. These are multicellular organisms that lack photosynthetic pigments and absorb nutrients directly from their surroundings. Mushrooms and toadstools are fungi. Molds that sometimes grow on leftover foods also belong to this kingdom. The mildews that may appear as small black spots in damp basements and bathrooms are also fungi. For many years, fungi were classified as plants (some out-of-date textbooks call them “nongreen plants”). However, they are quite different from plants in some basic ways. Their cell wall, a tough protective layer that surrounds the cell, is made of chitin rather than cellulose, the material that composes the cell wall of plants. And most importantly, unlike plants, fungi are not able to make their own food (heterotrophic versus autotrophic).

Kingdom Plantae. Plants make up this kingdom. These organisms are multicellular autotrophs. You are probably quite familiar with members of this kingdom, which includes flowering plants, mosses, ferns and trees.

Kingdom Animalia. Animals are multicellular heterotrophic organisms with specialized tissues that reproduce sexually and must take in oxygen to respire. Animals are heterotrophs, obtaining the nutrients and energy they need by feeding on organic compounds that have been made by other organisms. Animals are multicellular, which means that their bodies are composed of more than one cell. Animal cells are eukaryotic, containing a nucleus and membrane-enclosed organelles. Unlike plant, fungus and bacterial cells, animal cells do not have cell walls. Additionally, animals reproduce sexually (by exchanging sperm and eggs); some animals can also reproduce asexually.

BINOMIAL NOMENCLATURE

Binomial nomenclature is standard notation for naming species. Every species can be unambiguously identified with just two words, the combination of the genus and the species. The genus name is always capitalized while the species name is all lower case. In print format the scientific name is always in italics but when hand written the scientific name is underlined. Using this format, the identifying name for the human species is *Homo sapiens*, or Homo sapiens.

SYMBIOTIC RELATIONSHIPS

Symbiosis is a term used to describe a long-term relationship between two different species that live in close association with each other and in which at least one of the organisms benefits. There are three types of symbiotic relationships: mutualism, commensalism and parasitism.

In mutualism, both organisms benefit from their association. For example, termites have cellulose-digesting bacteria living in their digestive tracts. Without these microbes, termites could not obtain nutrients from the wood they eat. In turn, the termites provide the bacteria with food and a place to live. Cows have a similar association with the microbes that live in their digestive tracts.

Lichens consist of algal and fungal cells. Both types of cells benefit from this association. It allows them to live in environments in which neither could survive alone. Through photosynthesis, the algae produce food for themselves and for the fungi. The fungi provide moisture and the structural framework and attachment sites in which the algae grow.

Peas, clover and alfalfa are legumes. Legumes have nodules on their roots in which nitrogen-fixing bacteria grow. These bacteria convert nitrogen gas from the atmosphere into usable nitrogen compounds for plants. In this relationship, the plants are supplied with the nitrogen compounds they need, while the bacteria are given an environment in which they can grow and reproduce.

In commensalism, one organism benefits from the symbiotic relationship and the other is not affected. For example, pilotfish are small fish that live with sharks. They eat the scraps left over from the shark's feeding. Thus, the shark provides the pilotfish with food. As far as is known, the pilotfish neither helps nor hurts the shark. Barnacles may attach themselves to the large body surface of a whale. Barnacles are sessile (unable to move on their own) and rely on water currents to bring them food. The movements of the whale provide them with a constantly changing environment and food supply. The whale is not affected by the presence of the barnacles.

In parasitism, one organism benefits from the symbiosis and the other is harmed. The organism that benefits is called the parasite, while the organism that is harmed is called the host. Some parasites cause only slight damage to their hosts, while others kill the host. Tapeworms, for example, are parasites that live in the digestive tracts of various animals. There, they are provided with nutrients and an environment in which to grow and reproduce. However, the host is harmed by the presence of the tapeworms. The loss of nutrients and tissue damage caused by the worm can cause serious illness. There are also parasitic plants that grow on other plants. Two examples of plant parasites are mistletoe and Indian pipe.

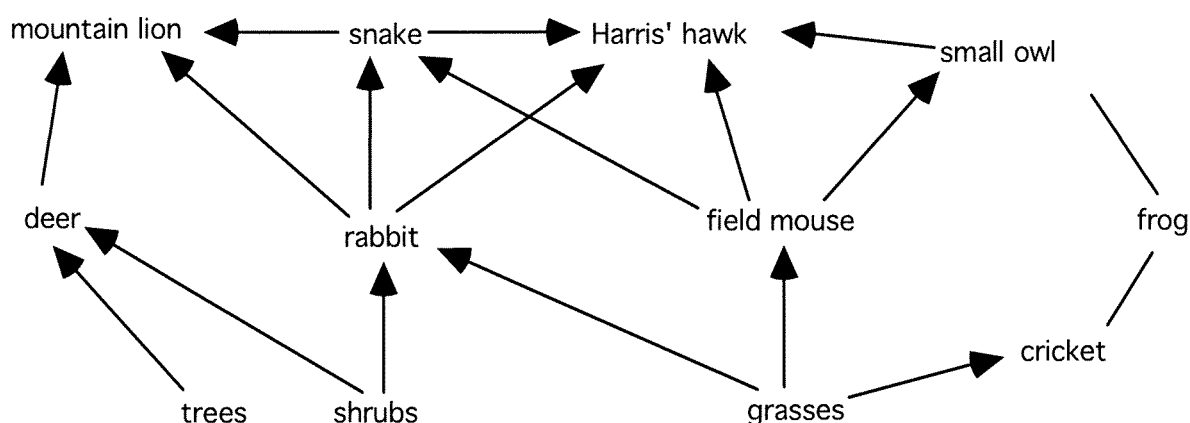
FOOD CHAINS AND FOOD WEBS

Within an ecosystem, there is a pathway of energy flow that always begins with the producers. Energy stored in organic nutrients synthesized by the producers is transferred to consumers when the plants are eaten. Herbivores are the primary consumers, or first-level consumers. The carnivores that feed on the herbivores are secondary consumers. For example mice feed on plants and are primary consumers. The snake that eats the mouse is a secondary consumer, while the hawk that eats the snake is a tertiary consumer, or third-level consumer. Since many consumers have a varied diet, they may be second-, third-, or higher-level consumers, depending on their prey. Each of these feeding relationships forms a food chain, a series of organisms through which food energy is passed. A simple food chain, with arrows showing the direction of energy flow, can be shown as:

grass ————— field mouse ————— great horned owl

where the grass is a producer, the field mouse is a primary consumer, and the owl is a secondary consumer.

Feeding relationships in an ecosystem are never just simple food chains, however. There are many types of organisms at each feeding level, and there are always many food chains in an ecosystem. Usually, each organism is part of several different food chains. These food chains are interconnected to form a food web. A simple food web could be shown as:



At every level in an ecosystem, there are organisms that act as decomposers. The decomposers make use of the wastes and remains of all organisms in the system. They use the energy they find in these materials for their own metabolism (life processes). At the same time, they break down organic compounds into inorganic compounds and make substances available for reuse. The decomposers are the final consumers in every food chain and food web.